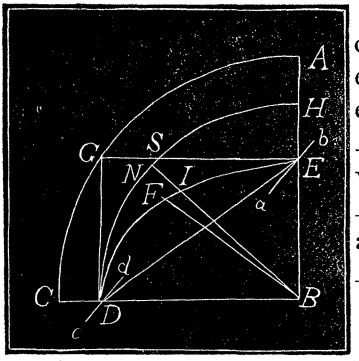
silver and galvanized with gold, the other hollow and made of gold. Required some means by which one may be determined from the other.

33. By Prof. W. W. Johnson, St. John's College, Annapolis, Md.—A circle is referred to rectangular axes passing through its centre. A tangent and ordinate are drawn from any point of the circumference. A distance n times the abscissa of this point is measured upon the axis of x, and from this point a perpendicular falls upon the tangent. Required the equation of the locus of the intersection of the perpendicular and tangent.

SOLUTION OF A QUESTION IN MECHANICS.

BY DR. J. B. HOLCOMB, NEWPORT, N. Y.



$A\,B$ and $C\,B$ are two equal lines perpendicular to each other, and $D\,E$ equal to either is inserted between them. Two equal and perfectly elastic balls fall from A and C towards a force at B, which force varies as the distance from B. At D and E the balls are deflected by planes $c\,d$ and $a\,b$ inclined at an angle of 45° to $A\,B$ and $C\,B$.

What will become of the balls?

Will they ever meet, and if so where? After such meeting, if it should happen, what will become of them then?

SOLUTION.

There may be two cases:

1. When the balls are deflected at E and D at the same instant.
2. When they begin their motion at A and C at the same instant.

For the 1st describe on $E\,B$ and $B\,D$ as semi-axes the quadrant of an ellipse $D\,F\,E$. Bisect the area $D\,F\,E\,B$ by the line $B\,F$, then the two balls will meet in the elliptic arc at the point F.

For the line $D\,E$ which joins the extremities of the two axes of the ellipse, being equal to either of the lines $A\,B$ and $C\,B$ is a measure of the force which either of the balls would have acquired in falling from

the centre B to the periphery $D\,F\,E$. Therefore each of the balls would describe the elliptic arc $D\,F\,E$ around B as a centre (Newton's Principia, Book 1st, Prop. 10, Cor. 1st), and they would meet at F, in the extremity of the line $B\,F$, which bisects the area $D\,F\,E\,B$ (Principia, Book 1st, Prop. 1st).

2d. Suppose the balls begin to fall at the same instant at A and C, then it may be shown by reasoning entirely similar to the above that the two balls will meet somewhere in the elliptic arc $D\,F\,E$.

To show at what point they will meet, let us with radii $B\,D$ and $B\,C$ describe the two circular quadrants $D\,S\,H$ and $C\,G\,A$, and let us suppose balls projected from the points C and D, with a force and direction requisite to cause them to describe the curves $D\,F\,E$, $D\,S\,H$, and $C\,G\,A$.

Now it is a well known principle in dynamics that the times of describing these arcs are all equal to each other. A ball in its passage along the arc $C\,G\,A$ would occupy the same time in reaching the point G, as the ball which passes from C to B would occupy in reaching D through the versed sine $C\,D$ of the arc $C\,G$, and in passing from G to A it would occupy the same time as the ball in its passage from D to B.

Hence the time of describing the arc $C\,G\,A$ is equal to the time of falling from C to B along the line $C\,B$. It is further evident that the time occupied from the beginning of motion at A and C till the two balls meet in the arc $D\,F\,E$ will be the same as either of them would occupy in passing from A or C to B, along the lines $A\,B$ and $C\,B$.

Therefore the time of passing through the arc of the quadrant $C\,G\,A$ is at once the measure of the time of passage through the arcs $D\,S\,H$ and $D\,F\,E$, and that of the balls in their passage from C to B and A to B, along the lines $C\,B$ and $A\,B$, and also that of the time from the beginning of motion at A and C, till the time of meeting in the elliptic arc $D\,F\,E$.

Hence if we bisect the arc $D\,S\,H$ or the angle $D\,B\,E$ by the line $B\,N$, the point I where this line cuts the arc of the ellipse will be the point where the two balls will meet.

What then will become of the balls ?

The answer to this question is now manifest.

On striking their respective planes at D and E the balls will be deflected in directions perpendicular to $A\,B$ and $C\,B$, and immediately

begin their motion in the elliptic orbit $D\ F\ E$, and continue till they meet at F, or I, when, being equal, and meeting with equal velocity, and being perfectly elastic, they will return by the same trajectory, and with the same velocity as that with which they met, striking their respective planes at D and E at the same instant, where they will be deflected in the directions $E\ A$ and $D\ C$, and arrive finally at A and C at the same instant.

Their whole force in those directions being now overcome, they will immediately begin to fall again through the same path, striking the planes, and describing the elliptic orbit, and meeting as before, and thus will they continue to describe and re-describe the same path, advancing and repelling each other forever.

BOOK NOTICES.

We have received from the publisher, *James S. Burnton*, 149 Grand street, New York, "*My Visit to the Sun; or, Critical Essay on Physics, Metaphysics and Ethics.*" By Lawrence S. Benson, author of "Benson's Geometry."

This book is an octavo vol. of 164 pages, and is executed on material, and in a style which is highly creditable to the publisher.

The author, no doubt, *intends* to represent, in this fictitious dialogue between himself and an inhabitant of the sun, by his own discourses, what he believes to be the current scientific views upon the subjects discussed, and by the discourses of the inhabitant of the sun, his own views upon the same subjects.

Anything like a critical review of the book would be absurd. It is sufficient to say that throughout the 164 pages we have not been able to find a single lucid paragraph; and that in the author's discourses, in which he has intended to represent the current scientific views on the subjects under discussion, he has invariably misrepresented or distorted science.

PAMPHLETS RECEIVED.

A METHOD OF COMPUTING ABSOLUTE PERTURBATIONS, by G. W. HILL, office of the American Ephemeris, Washington, D. C. 8 pages quarto. From "*Astronomische Nachrichten*," No. 1982.

A METHOD OF INTEGRATING THE SQUARE ROOTS OF QUADRATICS, by HENRY T. EDDY, C. E., Ph. D. 16 pages octavo. From the proceedings of the University Convocation, held at Albany, N. Y., August 6th, 7th & 8th, 1872.

DISCUSSION OF THE APPLIED FORCES IN A DRAW-BRIDGE, by H. T. EDDY, C. E., Princeton, N. J. 8 pages octavo. From *Van Nostrand's Eclectic Engineering Magazine* for June, 1874.

ANNUAL REGISTER OF THE RENSSELAER POLYTECHNIC INSTITUTE, Troy, N. Y., 1873–4.

CATALOGUE OF NORTH CAROLINA COLLEGE, Mt. Pleasant, N. C., 1873–4.